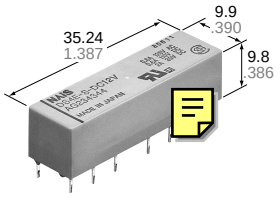
Discontinued

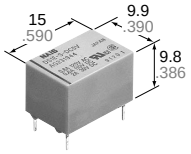
NAiS

HIGHLY SENSITIVE 1500 V FCC SURGE WITHSTANDING MINIATURE RELAY

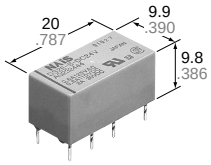
DS-RELAYS



DS4E



DS1E



DS2E

mm inch

FEATURES

- **High sensitivity: 200 mW pick-up power**
  100 mW pick-up power types available
- **Latching types available**
- **High switching capacity: 60 W, 125 V A**
- **High breakdown voltage: 1,500 V FCC surge between open contacts**
  1,000 V AC between open contacts
- **DIP-1C type can be used with 14 pin IC socket**
  2C type can be used with 16 pin IC socket,
  4C type can be used with 2 sets of 14 pin IC sockets
- **Gold-cap silver palladium types available for 2 Form C type**

FLOC Type:

- **Low bounce time**
- **High contact forces**
- **Large load switching range 10^-10 -- 90W (250 VA)**

SPECIFICATIONS

Contact

Arrangement		1, 2 , 4 Form C	Floc type 2 Form C
Initial contact resistance, max. (By voltage drop 6 V DC 1 A)		50 mΩ	
Contact material		Gold-clad sliver	
Rating (resistive)	Max. switching power	60 W, 125 VA	
	Max. switching voltage	220 V DC, 250 V AC	
	Max. switching current	2 A DC, AC	3 A DC, AC
	Max. carrying current	3 A DC, AC	4 A DC, AC
Expected life (min. operations) Mechanical (at 600 cpm)		10^8 (10^7 for 1 Form C 2 coil latching type)	
Electrical 2 A 30 V DC resistive 1 A 30 VDC resistive		5×10^5	

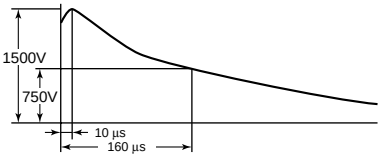
* Gold capped silver-palladium contact also available for 2 Form C 10^7 operations at 0.1 A 50 V DC resistive

Coil (polarized) (at 20°C 68°F)

M type	Single side stable	Minimum operating power	Approx. 200 mW
		Nominal operating power	Approx. 400 mW
	1 coil latching	Minimum set and reset power	Approx. 90 mW
		Nominal set and reset power	Approx. 180 mW
	2 coil latching	Minimum set and reset power	Approx. 180 mW
		Nominal set and reset power	Approx. 360 mW
S type	Single side stable	Minimum operating power	Approx. 100 mW (128 mW)*
		Nominal operating power	Approx. 200 mW
	1 coil latching	Minimum set and reset power	Approx. 45 mW (58 mW)*
		Nominal set and reset power	Approx. 90 mW
	2 coil latching	Minimum set and reset power	Approx. 90 mW (115 mW)*
		Nominal set and reset power	Approx. 180 mW

* For 1 Form C high sensitive types.

The FCC (Federal Communication Commission) requires the following standard as Breakdown Voltage specifiication.



Characteristics (at 20°C 68°F)

Max. operating speed		20 cpm at rated load 50 cps at low level load	
Initial insuration resistance*1		Min. 100 MΩ (at 500 V DC)	
Initial breakdown voltage*2	Type of relay	(DS1-S type)	(Other types)
	Between open contacts	500 Vrms	1,000 Vrms
	Between contacts sets	—	1,000 Vrms
	Between contacts and coil	1,000 Vrms	1,500 Vrms
FCC surge voltage between contacts and coil		1,500 V (Expect DS1-S type)	
Operate time*3 (at nominal voltage)		Approx. 3 ms	
Release time (without diode)*3 (at nominal voltage)		Approx. 2 ms	
Set time*3 (at nominal voltage)		Approx. 3 ms	
Reset time*3 (at nominal voltage)		Approx. 3 ms	
Temperature rise (at nominal voltage, Contact current: 2A)		Max. 65°C	
Shock resistance	Functional*4	1C, 2C:Min. 490 m/s² {50 G} 4C:Min. 294 m/s² {30 G}	
	Destructive*5	Min. 980 m/s² {100 G}	
Vibration resistance	Functional*6	10 to 55 Hz at double amplitude of 3.3 mm	
	Destructive	10 to 55 Hz at double amplitude of 5 mm	
Conditions for operation, transport and storage*7 (Not freezing and condensing at low temperature)	Ambient temp.	–40°C to +70°C –40°F to +158°F	
	Humidity	5 to 85% R.H.	
Unit weight	1 Form C	Approx. 3.2g .11oz	
	2 Form C	Approx. 4g .14oz	
	4 Form C	Approx. 7g .25oz	

Remarks

* Specifications will vary with foreign standards certification ratings.
*1 Measurement at same location as "Initial breakdown voltage" section
*2 Detection current: 10 mA
*3 Excluding contact bounce time
*4 Half-wave pulse of sine wave: 11ms; detection time: 10µs
*5 Half-wave pulse of sine wave: 6ms

Remarks, continued
*6 Detection time: 10µs
*7 Refer to 5. Conditions for operation, transport and storage mentioned in AMBIENT ENVIRONMENT (Page 61)

TYPICAL APPLICATIONS

- Telecommunication equipment
- Office equipment
- Computer peripherals
- Security equipment
- Measuring instrumentation

ORDERING INFORMATION

Ex. DS [2] [E] — [M] [L2] — [DC 48 V] — [R]

Contact arrangement	Classification of type	Sensitivity	Operating function	Coil voltage
1: 1 Form C 2: 2 Form C 4: 4 Form C	E: Amber sealed type	M: 400mW nominal operating power S: 200 mW nominal operating power Nil: 200 mW DS2E with FLOC contact F: 140 mW DS2E with FLOC high sensitive	Nil: Single side stable L: 1 coil latching L2: 2 coil latching	DC 1.5, 3, 5, 6, 9, 12, 24, 48 V

(Notes) 1. *Reverse polarity types available (add suffix –R).
2. For UL/CSA recognized types, add suffix UL/CSA.
3. Standard packing: Carton: 50 pcs. Case: 500 pcs.

TYPES

Single side stable

	Nominal Voltage, V DC	Part No.		
		1 Form C	2 Form C	4 Form C
M (400 mW) type	1.5	DS1E-M-DC1.5V	DS2E-M-DC1.5V	DS4E-M-DC1.5V
	3	DS1E-M-DC3V	DS2E-M-DC3V	DS4E-M-DC3V
	5	DS1E-M-DC5V	DS2E-M-DC5V	DS4E-M-DC5V
	6	DS1E-M-DC6V	DS2E-M-DC6V	DS4E-M-DC6V
	9	DS1E-M-DC9V	DS2E-M-DC9V	DS4E-M-DC9V
	12	DS1E-M-DC12V	DS2E-M-DC12V	DS4E-M-DC12V
	24	DS1E-M-DC24V	DS2E-M-DC24V	DS4E-M-DC24V
	48	DS1E-M-DC48V	DS2E-M-DC48V	DS4E-M-DC48V
S (200 mW) type	1.5	DS1E-S-DC1.5V	DS2E-S-DC1.5V	DS4E-S-DC1.5V
	3	DS1E-S-DC3V	DS2E-S-DC3V	DS4E-S-DC3V
	5	DS1E-S-DC5V	DS2E-S-DC5V	DS4E-S-DC5V
	6	DS1E-S-DC6V	DS2E-S-DC6V	DS4E-S-DC6V
	9	DS1E-S-DC9V	DS2E-S-DC9V	DS4E-S-DC9V
	12	DS1E-S-DC12V	DS2E-S-DC12V	DS4E-S-DC12V
	24	DS1E-S-DC24V	DS2E-S-DC24V	DS4E-S-DC24V
	48	DS1E-S-DC48V	DS2E-S-DC48V	DS4E-S-DC48V

1 coil latching

	Nominal Voltage, V DC	Part No.		
		1 Form C	2 Form C	4 Form C
M (180 mW) type	1.5	DS1E-ML-DC1.5V	DS2E-ML-DC1.5V	DS4E-ML-DC1.5V
	3	DS1E-ML-DC3V	DS2E-ML-DC3V	DS4E-ML-DC3V
	5	DS1E-ML-DC5V	DS2E-ML-DC5V	DS4E-ML-DC5V
	6	DS1E-ML-DC6V	DS2E-ML-DC6V	DS4E-ML-DC6V
	9	DS1E-ML-DC9V	DS2E-ML-DC9V	DS4E-ML-DC9V
	12	DS1E-ML-DC12V	DS2E-ML-DC12V	DS4E-ML-DC12V
	24	DS1E-ML-DC24V	DS2E-ML-DC24V	DS4E-ML-DC24V
	48	DS1E-ML-DC48V	DS2E-ML-DC48V	DS4E-ML-DC48V
S (90 mW) type	1.5	DS1E-SL-DC1.5V	DS2E-SL-DC1.5V	DS4E-SL-DC1.5V
	3	DS1E-SL-DC3V	DS2E-SL-DC3V	DS4E-SL-DC3V
	5	DS1E-SL-DC5V	DS2E-SL-DC5V	DS4E-SL-DC5V
	6	DS1E-SL-DC6V	DS2E-SL-DC6V	DS4E-SL-DC6V
	9	DS1E-SL-DC9V	DS2E-SL-DC9V	DS4E-SL-DC9V
	12	DS1E-SL-DC12V	DS2E-SL-DC12V	DS4E-SL-DC12V
	24	DS1E-SL-DC24V	DS2E-SL-DC24V	DS4E-SL-DC24V
	48	DS1E-SL-DC48V	DS2E-SL-DC48V	DS4E-SL-DC48V

2 coil latching

	Nominal Voltage, V DC	Part No.		
		1 Form C	2 Form C	4 Form C
M (360 mW) type	1.5	DS1E-ML2-DC1.5V	DS2E-ML2-DC1.5V	DS4E-ML2-DC1.5V
	3	DS1E-ML2-DC3V	DS2E-ML2-DC3V	DS4E-ML2-DC3V
	5	DS1E-ML2-DC5V	DS2E-ML2-DC5V	DS4E-ML2-DC5V
	6	DS1E-ML2-DC6V	DS2E-ML2-DC6V	DS4E-ML2-DC6V
	9	DS1E-ML2-DC9V	DS2E-ML2-DC9V	DS4E-ML2-DC9V
	12	DS1E-ML2-DC12V	DS2E-ML2-DC12V	DS4E-ML2-DC12V
	24	DS1E-ML2-DC24V	DS2E-ML2-DC24V	DS4E-ML2-DC24V
	48	DS1E-ML2-DC48V	DS2E-ML2-DC48V	DS4E-ML2-DC48V
S (180 mW) type	1.5	DS1E-SL2-DC1.5V	DS2E-SL2-DC1.5V	DS4E-SL2-DC1.5V
	3	DS1E-SL2-DC3V	DS2E-SL2-DC3V	DS4E-SL2-DC3V
	5	DS1E-SL2-DC5V	DS2E-SL2-DC5V	DS4E-SL2-DC5V
	6	DS1E-SL2-DC6V	DS2E-SL2-DC6V	DS4E-SL2-DC6V
	9	DS1E-SL2-DC9V	DS2E-SL2-DC9V	DS4E-SL2-DC9V
	12	DS1E-SL2-DC12V	DS2E-SL2-DC12V	DS4E-SL2-DC12V
	24	DS1E-SL2-DC24V	DS2E-SL2-DC24V	DS4E-SL2-DC24V
	48	DS1E-SL2-DC48V	DS2E-SL2-DC48V	DS4E-SL2-DC48V

Notes:

1. Reverse polarity types available (add suffix-R).
2. Standard packing: carton: 50 pcs.; case: 500 pcs.

DS FLOC Types

	Nominal Voltage, V DC	Part No.		
		Single side stable	1 coil latching	2 coil latching
DS2E with FLOC contact	1.5	DS2E-DC1.5V	DS2E-L-DC1.5V	DS2E-L2-DC1.5V
	3	DS2E-DC3V	DS2E-L-DC3V	DS2E-L2-DC3V
	5	DS2E-DC5V	DS2E-L-DC5V	DS2E-L2-DC5V
	6	DS2E-DC6V	DS2E-L-DC6V	DS2E-L2-DC6V
	9	DS2E-DC9V	DS2E-L-DC9V	DS2E-L2-DC9V
	12	DS2E-DC12V	DS2E-L-DC12V	DS2E-L2-DC12V
	24	DS2E-DC24V	DS2E-L-DC24V	DS2E-L2-DC24V
	48	DS2E-DC48V	DS2E-L-DC48V	DS2E-L2-DC48V
DS2E with high sensitive	3	DS2E-F-DC3V	DS2E-FL-DC3V	DS2E-FL2-DC3V
	5	DS2E-F-DC5V	DS2E-FL-DC5V	DS2E-FL2-DC5V
	6	DS2E-F-DC6V	DS2E-FL-DC6V	DS2E-FL2-DC6V
	9	DS2E-F-DC9V	DS2E-FL-DC9V	DS2E-FL2-DC9V
	12	DS2E-F-DC12V	DS2E-FL-DC12V	DS2E-FL2-DC12V
	24	DS2E-F-DC24V	DS2E-FL-DC24V	DS2E-FL2-DC24V

COIL DATA (at 20°C 68°F)

Single side stable

	Nominal voltage, V DC	Pick-up voltage, V DC (max.)		Drop-out voltage, V DC (min.)	Coil resistance, Ω (±10%)	Maximum allowable, V DC (at 50°C 122°F)	
		1 Form C	2, 4 Form C			1 Form C	2, 4 Form C
M type	1.5	1.05	1.05	0.15	5.63	1.8	2.25
	3	2.1	2.1	0.3	22.5	3.6	4.5
	5	3.5	3.5	0.5	62.5	6	7.5
	6	4.2	4.2	0.6	90	7.2	9
	9	6.3	6.3	0.9	203	10.8	13.5
	12	8.4	8.4	1.2	360	14.4	18
	24	16.8	16.8	2.4	1440	28.8	36
	48	33.6	33.6	4.8	5760	57.6	72
S type	1.5	1.2	1.05	0.15	11.3	2.4	3
	3	2.4	2.1	0.3	45	4.8	6
	5	4.0	3.5	0.5	125	8.0	10
	6	4.8	4.2	0.6	180	9.6	12
	9	7.2	6.3	0.9	405	14.4	18
	12	9.6	8.4	1.2	720	19.2	24
	24	19.2	16.8	2.4	2880	28.4	48
	48	38.6	33.6	4.8	11520	76.8	96

1 coil latching

	Nominal voltage, V DC	Reset Set, V DC (max.)		Coil resistance, Ω (±10%)	Maximum allowable, V DC (at 50°C 122°F)	
		1 Form C	2, 4 Form C		1 Form C	2, 4 Form C
M type	1.5	1.05	1.05	12.5	1.8	2.25
	3	2.1	2.1	50	3.6	4.5
	5	3.5	3.5	139	6	7.5
	6	4.2	4.2	200	7.2	9
	9	6.3	6.3	450	10.8	13.5
	12	8.4	8.4	800	14.4	18
	24	16.8	16.8	3200	28.8	36
	48	33.6	33.6	12800	57.6	72
S type	1.5	1.2	1.05	25	2.4	3
	3	2.4	2.1	100	4.8	6
	5	4.0	3.5	278	8.0	10
	6	4.8	4.2	400	9.6	12
	9	7.2	6.3	900	14.4	18
	12	9.6	8.4	1600	19.2	24
	24	19.2	16.8	6400	38.4	48
	48	38.4	33.6	25600	76.8	96

2 coil latching

	Nominal voltage, V DC	Reset Set, V DC (max.)		Coil resistance, Ω (±10%)		Maximum allowable, V DC (at 50°C 122°F)	
		1 Form C	2,4 Form C	Coil I	Coil II	1 Form C	2,4 Form C
M type	1.5	1.05	1.05	6.25		1.8	2.25
	3	2.1	2.1	25		3.6	4.5
	5	3.5	3.5	69.4		6	7.5
	6	4.2	4.2	100		7.2	9
	9	6.3	6.3	225		10.8	13.5
	12	8.4	8.4	400		14.4	18
	24	16.8	16.8	1600		28.8	36
	48	33.6	33.6	6400		57.6	72
S type	1.5	1.2	1.05	12.5		2.4	3
	3	2.4	2.1	50		4.8	6
	5	4.0	3.5	139		8.0	10
	6	4.8	4.2	200		9.6	12
	9	7.2	6.3	450		14.4	18
	12	9.6	8.4	800		19.2	24
	24	19.2	16.8	3200		38.4	48
	48	38.4	33.6	12800		76.8	96

DS-FLOC 2 Form C

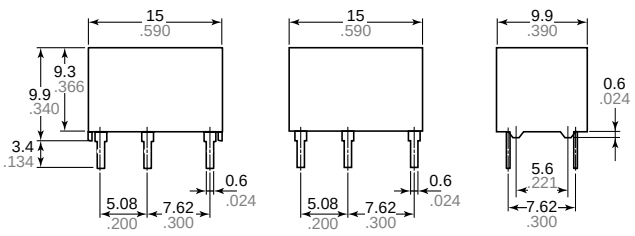
	Nominal voltage, V DC	Single side stable				1 coil latching			2 coil latching			
		Pick-up voltage V DC (max.)	Drop-out voltage V DC (min.)	Coil resistance, Ω (±10%)	Max. allowable V DC (at 40°C)	Reset Set V DC (max.)	Coil resistance, Ω (±10%)	Max. allowable V DC (at 40°C)	Reset Set V DC (max.)	Coil resistance, Ω (±10%)		Max. allowable V DC (at 40°C)
										Coil I	Coil II	
DS2E with FLOC contact	1.5	1.1	0.15	11.25	2.82	1.1	22.5	3.9	1.1	11.25		2.82
	3	2.1	0.3	45	5.64	2.1	90	7.98	2.1	45		5.64
	5	3.5	0.5	125	9.41	3.5	250	13.30	3.5	125		9.41
	6	4.2	0.6	180	11.29	4.2	360	15.97	4.2	180		11.29
	9	6.3	0.9	405	16.94	6.3	810	23.95	6.3	405		16.94
	12	8.4	1.2	720	22	8.4	1440	31.94	8.4	720		22.58
	24	16.8	2.4	2880	45	16.8	5760	63.88	16.8	2880		45.17
	48	33.6	4.8	11520	90	33.6	19000	116.02	33.6	6000		90.34
DS2E with FLOC high sensitive	3	2.4	0.3	60	6.78	2.4	120	9.59	2.4	60		6.78
	5	4.0	0.5	167	11.29	4	334	15.97	4	167		11.29
	6	4.8	0.6	240	13.57	4.8	480	19.19	4.8	240		13.57
	9	7.2	0.9	540	20.27	7.2	1080	28.66	7.2	540		20.27
	12	9.6	1.2	960	27	9.6	1920	47.83	9.6	960		27.01
	24	19.2	2.4	3840	54	19.2	7680	63.88	19.2	3840		53.99

DIMENSIONS

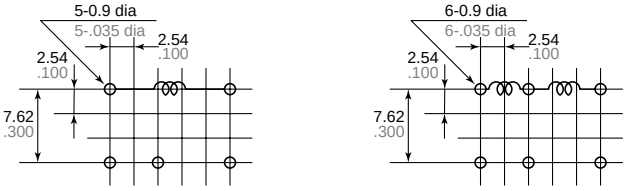
mm inch

1 Form C

Single side stable, 1 coil latching, 2 coil latching



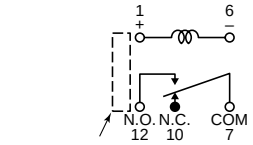
PC board pattern (Copper-side view)
Single side stable, 1 coil latching 2 coil latching



Tolerance: ±0.1 ± .004

General tolerance: ±0.3 ±.012

Schematic (Bottom view)
Single side stable
Deenergized condition



• A polarity bar showing the relay direction can replace the schematic.

1 coil latching

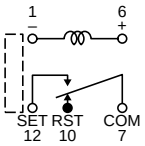


Diagram shows the "reset" position when terminals 1 and 6 are energized.
Energize with reverse polarity to transfer contacts.

2 coil latching

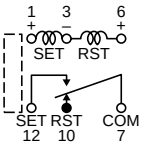
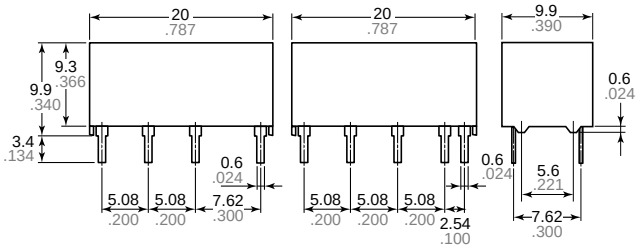


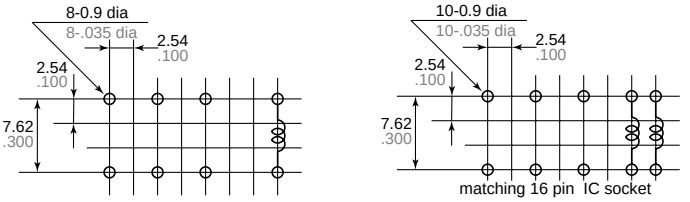
Diagram shows the "reset" position when terminals 3 and 6 are energized.
Energize terminals 1 and 3 to transfer contacts.

2 Form C

Single side stable, 1 coil latching, 2 coil latching



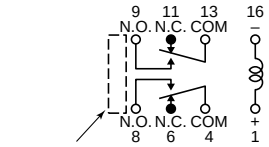
PC board pattern (Copper-side view)
Single side stable, 1 coil latching 2 coil latching



Tolerance: ±0.1 ± .004

General tolerance: ±0.3 ±.012

Schematic (Bottom view)
Single side stable
Deenergized condition



• A polarity bar showing the relay direction can replace the schematic.

1 coil latching

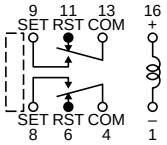


Diagram shows the "reset" position when terminals 1 and 16 are energized.
Energize with reverse polarity to transfer contacts.

2 coil latching

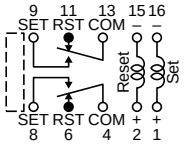
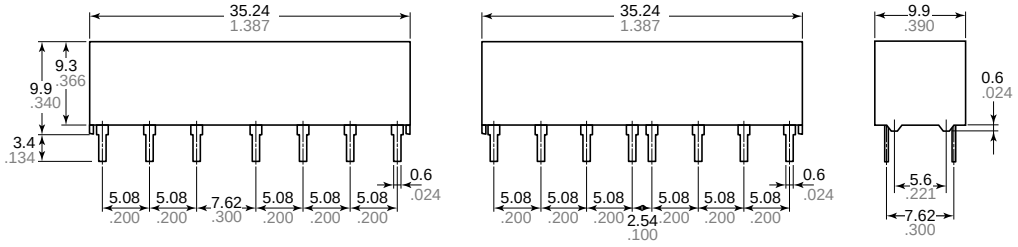


Diagram shows the "reset" position when terminals 2 and 15 are energized.
Energize terminals 1 and 16 to transfer contacts.

4 Form C

mm inch

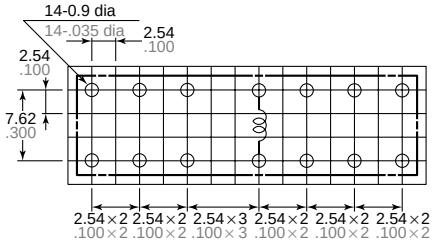
Single side stable, 1 coil latching, 2 coil latching



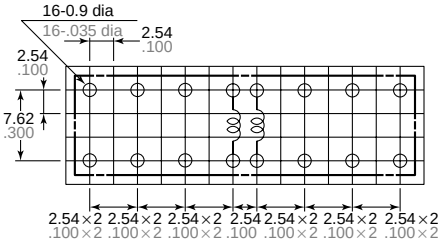
General tolerance: ±0.3 ±.012

PC board pattern (Copper-side view)

Single side stable, 1 coil latching



2 coil latching

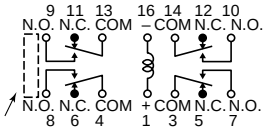


Tolerance: ±0.1 ± .004

Schematic (Bottom view)

Single side stable

Deenergized condition



• A polarity bar showing the relay direction can replace the schematic.

1 coil latching

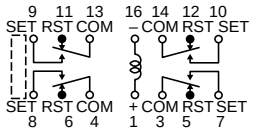


Diagram shows the "reset" position when terminals 1 and 16 are energized.
Energize with reverse polarity to transfer contacts.

2 coil latching

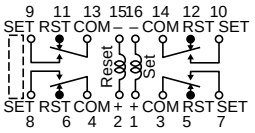
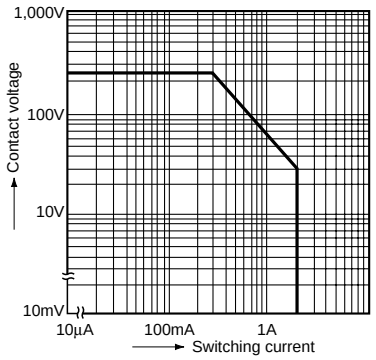


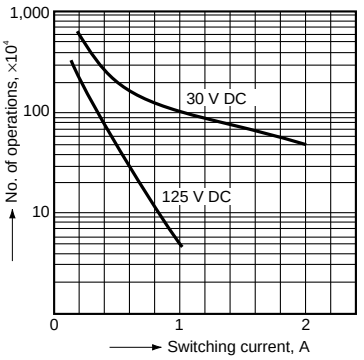
Diagram shows the "reset" position when terminals 2 and 15 are energized.
Energize terminals 1 and 16 to transfer contacts.

REFERENCE DATA

1. Maximum switching capacity



2. Life curve (Resistive load)



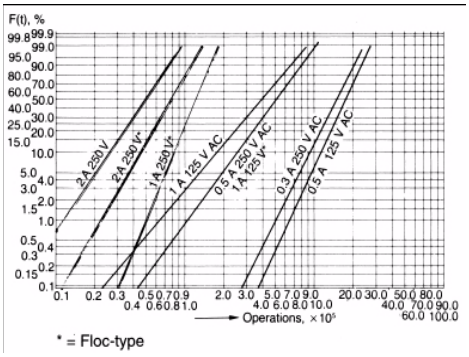
3. Contact reliability for AC loads

Sample: DS2-M-DC24V

a. Cycle rate: 20 cpm.

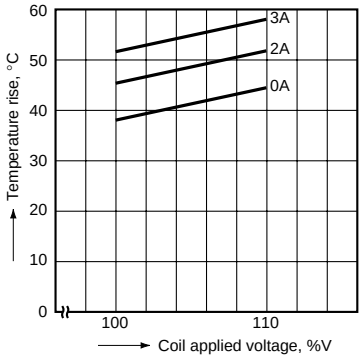
b. Load (resistive): 1A 125 V AC, 0.5 A 250 V AC, 0.3 A 250 V AC, 0.5 A 125 V AC

c. Detection: 200 mΩ

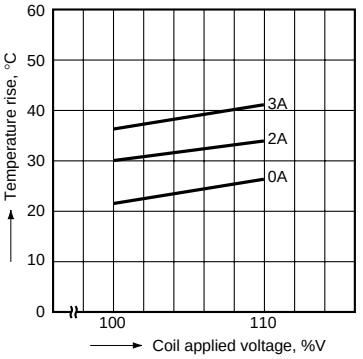


* = Floc-type

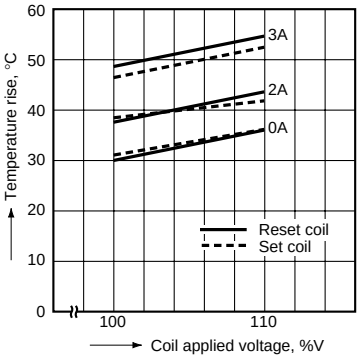
4-(1). Coil termperature rise
(2 Form C single side stable type)
Point measured: Inside the coil
Ambient temperature: 18° to 19°C 64° to 66°F



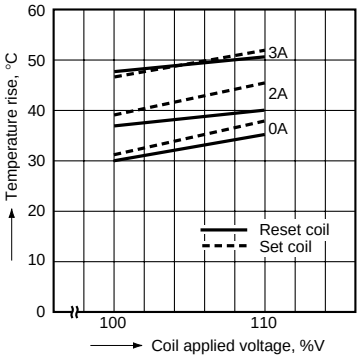
4-(2). Coil tempeature rise
(4 Form C single side stable type)
Point measured: Inside the coil
Ambient temperature: 17° to 18°C 63° to 64°F



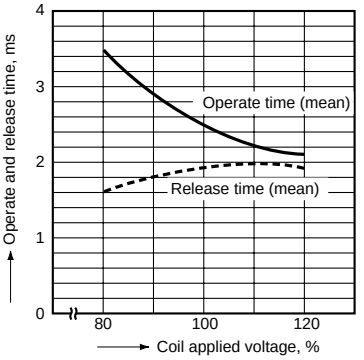
4-(3). Coil temperature rise
(2 Form C 2 coil latching type)
Point measured: Inside the coil
Ambient temperature: 20° to 21°C 68° to 70°F



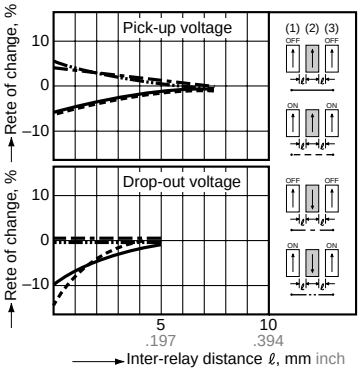
4-(4). Coil temperature rise
(4 Form C 2 coil latching type)
Point measured: Inside the coil
Ambient temperature: 20°C 68°F



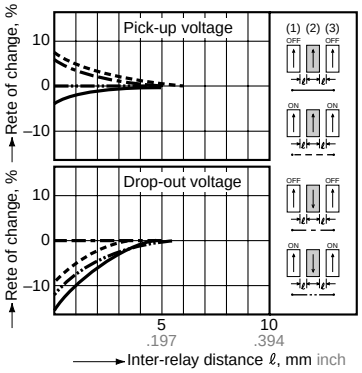
5. Operate and release time characteristics
(2 Form C single side stable type)
Test condition: Without diode connected to coil in parallel



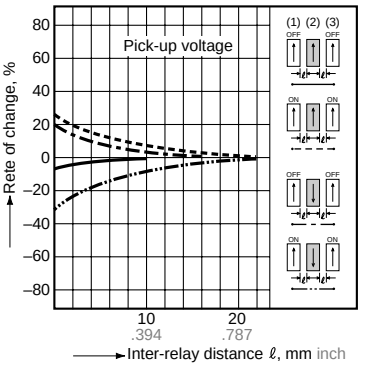
6-(1). Influence of adjuacent mounting
(1 Form C)

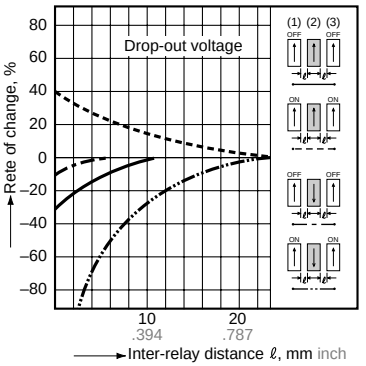


6-(2). Influence of adjacent mounting
(2 Form C)



6-(3). Influence of adjacent mounting
(4 Form C)





NOTES

Rating

Standard	File No.	Rating
UL	E43149	0. 6 A 125 V AC
CSA	LR26550	0.6 V 125 V AC 2 A 30 V DC

For Cautions for Use, see Relay Technical Information (Page 48 to 76).